Australian Standard™

Test methods for bare overhead conductors

Standards Australia

This Australian Standard was prepared by Committee EL-010, Overhead Lines. It was approved on behalf of the Council of Standards Australia on 30 July 2002 and published on 23 August 2002.

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Australian Chamber of Commerce and Industry

Australian Electrical and Electronic Manufacturers Association

Australian Porcelain Insulators Association

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee EL-010, Overhead Lines.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to provide procedures for purchasers wishing to specify performance tests on complete conductors.

Conductor users and manufacturers have recognized that the variety of conductors and conductor constructions available is unlimited and that it is becoming necessary to find the characteristics of the complete conductor. In addition there is a need to critically examine existing conductors that may have suffered degradation because of their service history. Existing conductor Standards specify only the properties of the individual wires. Conductor properties are calculated from the wire data.

During its 1983 meeting, CIGRE* Australian panel 22 'Overhead Lines' established a local working group to review the matter and in particular to determine—

(a) which complete conductor characteristics were needed to enable the user to compare conductor types and to confidently predict the performance of conductors in service;

(b) how these characteristics were to be determined; and

(c) which procedures would optimize the handling of conductors during erection.

Items (a) and (b) were completed and this Standard sets out performance tests for complete conductors.

With regard to Item (c), it was recognized that current methods used for the calculation of sag data for conductor erection include somewhat arbitrary allowances for the effect of run-out tensions, time spent in sheaves and more sagging and for permanent elongation.

While these methods have proved adequate in most conditions there is a growing need for more precise analysis especially when using unfamiliar conductors and when designing for extreme temperatures.

The information from these tests can be used with the CIGRE temperature compensation method (Ref. 1).

In addition, computer models are being developed (Ref. 2) and power line designers and constructors are encouraged to make use of the techniques.

This Standard provides procedures for purchasers wishing to specify performance tests on complete conductors. The tests have three main purposes, as follows:

(i) To provide a basis for comparison of the design of conductors in terms of their mechanical properties.

(ii) To provide conductor data for the new sag tension computer programs which are being developed to provide a more realistic model of conductor behaviour over its service life (Ref. 2).

(iii) To provide acceptance criteria for conductor purchasers. It is envisaged that the tests will be regarded as 'Type Tests' for a particular conductor type and will not be required for every production run.

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* International Conference on Large High Tension Electric Systems.

An article, ‘A practical method of conductor creep determination’, published in 1972 in ELECTRA No. 24 (Ref. 1) gave results of typical values of permanent elongation based on measurements from lines in service. The method of determination of permanent elongation specified in this Standard is based on principles laid down by CIGRE WG 05 in document 22-78(WG 05)02 (Ref. 3), which provides some guidance on the use of predictor equations and evaluation methods.

‘Permanent elongation of conductors. Predictor equations and evaluation methods’, from ELECTRA no. 75 March 1981, (Ref. 4) contains the final version of the complete creep test method. The methods specified in this Standard have taken advantage of experience gained by previous laboratory evaluation of creep and current technology for improved accuracy in measurement and temperature control.

REFERENCES

1 A practical method of conductor creep determination. CIGRE ELECTRA no. 24, 1972.

2 BARRETT, J.S., DUTTA, S. and NIGOL, O. *A new computer model of A.C.S.R. conductors.* IEEE Trans. on Power Apparatus & Systems, vol. PAS-102, no. 3, March 1983.

3 CIGRE Document 22-78 (WG 05)02.

4 Permanent elongation of conductors. Predictor equations and evaluation methods. CIGRE ELECTRA no. 75, March 1981.

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1 SCOPE

This Standard specifies methods for determining the following properties and characteristics of bare conductors for use in overhead lines:

(a) Geometric properties.

(b) Breaking load.

(c) Coefficient of thermal elongation.

(d) Stress-strain characteristics.

(e) Creep characteristics (permanent elongation).

(f) d.c. resistance of conductors.

(g) Fatigue characteristics.

(h) Thermal aging characteristics.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS
1222 Steel conductors and stays—Bare overhead
1222.1 Part 1: Galvanized (SC/GZ)
1222.2 Part 2: Aluminium clad (SC/AC)

1391 Methods for tensile testing of metals

1531 Conductors—Bare overhead—Aluminium and aluminium alloy

1746 Conductors—Bare overhead—Hard-drawn copper

2193 Methods for the calibration and grading of force-measuring systems of testing machines

3607 Conductors—Bare overhead, aluminium and aluminium alloy—Steel reinforced

IEC
60468 Method of measurement of resistivity of metallic materials

3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

3.1 Aeolian vibration

A resonant vibration induced in overhead conductors by steady cross winds.

3.2 Batch

A quantity of conductor from which a sample is to be drawn and inspected to determine compliance with acceptability criteria. Each batch is assumed, as far as practicable, to consist of materials of a single type (grade, class, size, and composition), and to have been manufactured under essentially the same conditions at the same time.

